

RESONSE TO NON-COMPLIANT AMENDMENT

Serial Number: 10/618,095

Filing Date: July 11, 2003

Title: INDICATOR OF REMAINING ENERGY IN STORAGE CELL OF IMPLANTABLE MEDICAL DEVICE

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IN THE DRAWINGS

Enclosed is a Replacement Sheet for Figures 3, 4 and 5.

REMARKS

This is in response to the Notice of Non-Compliant Amendment dated October 3, 2005. Applicant has removed the underlining from the newly added paragraphs.

No claims are amended, cancelled, or added. As a result, claims 1-30 remain pending in this patent application.

Objection to the Drawings

The drawings were objected to as not showing the following claimed features: starting time, ending time, first time period, first stored data, the polarization angle, etc. Accordingly, Applicant has amended FIG. 3 to show t_2 as the starting time and t_4 as the ending time. Because the claimed first time period is defined by the starting and ending times, no amendment to the drawings is believed needed. Because FIG. 1 shows stored data 130, no amendment to the drawings is believed needed. Because FIGS. 4 and 5 shows angles θ_1 and θ_2 , and the specification explains how the polarization angle is computed (see Application at page 8, lines 1 – 11), no amendment to the drawings is believed needed.

In sum, Applicant respectfully requests reconsideration and withdrawal of the objection to the drawings or, in the alternative, further explanation of the basis of these objections or a telephone call to Applicant's counsel to discuss resolving these minor informalities.

Objection to the Specification

The specification was objected to as failing to provide proper antecedent basis for the claimed subject matter. Applicant has amended the specification to incorporate a "Summary" that provides antecedent basis for the claimed subject matter. Applicant respectfully submits that no new matter is added by this amendment to the specification because support for the same is present in the claims as originally filed. Accordingly, Applicant respectfully requests withdrawal of the objection.

Objection to the Claims

Claim 10 was objected due to as lacking antecedent basis for “the two different stored capacity values.” Applicant has reviewed this objection and believes that it is in error. Applicant respectfully requests reconsideration or clarification. In particular, Applicant respectfully requests the Examiner’s suggestion for a suitable alternative language should the Examiner decide that the objection is warranted. Applicant welcomes any such suggestion and will consider amending the language of claim 10, if appropriate.

§102 Rejection of the Claims

Claims 1 and 30 were rejected under 35 U.S.C. § 102(e) for anticipation by Kawakami et al. (U.S. Patent No. 6,563,318). Applicant respectfully traverses, for the reasons discussed below. As an initial note, Applicant notes that Kawakami et al. is cited as prior art only under § 102(e). Accordingly, Applicant respectfully reserves the right to swear behind Kawakami et al. or any other references under § 102(e) as permitted under 37 C.F.R. § 1.131.

Applicant cannot find in the cited portions of Kawakami et al. any disclosure of comparing a measured change in terminal voltage across a cell during a first time period (during which a substantially constant first current pulse is drawn) to first stored data to determine the energy remaining in the cell. The Office Action relies on the Abstract and FIG. 25 of Kawakami et al. FIG. 25 of Kawakami apparently shows a first open circuit battery voltage, VOC0, *before* a substantially constant current is drawn, and a second open circuit battery voltage, VOC1, *after* the substantially constant current is drawn. The cited portion of Kawakami apparently computes certain battery characteristics using these *open-circuit* voltages, instead of using a change in cell terminal voltage during a first time period when a substantially constant first current pulse is being drawn, as similarly recited or incorporated in all of the present claims 1-30. For example, Kawakami expressly states:

3. Judgment of Whether the Electricity Storable Capacity is Decreased

... the rechargeable battery is subjected to judgment of whether the electricity storable capacity thereof is decreased in the following manner.

With reference to the graph shown in FIG. 25(1), for the rechargeable battery in a paused state, the *open-circuit* voltage (VOC_0) is measured. Thereafter, from the rechargeable battery, an electricity quantity $q_{sub.1}$ of a current $I_{sub.1}$ times a time t_1 is discharged, where the battery voltage (V) of the battery during the discharging operation and the *open-circuit* voltage (VOC_1) of the battery after termination of the discharging operation are measured. In this case, when the rechargeable battery is that the electricity storable capacity is not decreased, there should be provided such a result that the remaining capacity (Q) when the open-circuit voltage is VOC_0 is $Q_0 = Q(VOC_0)$, the remaining capacity after the discharging of the electricity quantity q_1 is $Q_0 - q_1$, and the *open-circuit* voltage is $Voc(Q_0 - q_1)$.

When the difference between the *open-circuit* voltage $Voc(Q_0 - q_1)$ and the measured value Voc_1 is $[Voc(Q_0 - q_1) - Voc_1] > f_1$ ($0 < f_1$), the rechargeable battery to be inspected is judged that the electricity storable capacity thereof is decreased.

(Kawakami et al. at col. 20, line 58 through col. 21, line 17 (emphasis added)). As seen in the above-quoted passage, Kawakami et al. makes its determinations using open-circuit voltages, instead of using a change in cell terminal voltage during a time period when a substantially constant first current pulse is being drawn, as similarly recited or incorporated in all of the present claims 1-30. Therefore, Kawakami et al. actually teaches away from the present claims 1 and 30. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection of these claims.

§103 Rejection of the Claims

1. Claims 2 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above, in view of WO-94/02202 (WO02). Applicant respectfully traverses. First, for the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything in WO02 that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims.

Moreover, the Office Action has cited no motivation in either Kawakami et al. and WO02 for combining these references in the manner of the Office Action. In fact, both Kawakami et al. and WO02 actually teach away from such a combination. For example, Kawakami et al. itself expressly recognizes that various battery characterization methods are inapplicable to other battery chemistries. (See Kawakami et al. at col. 2, line 27 – col. 30, line 46.) Moreover, WO02 itself expressly found lithium manganese dioxide to be impractical. (See WO02 at col. 3, lines 9-10.)

Because Kawakami et al. and WO02 fail to establish either a *prima facie* case of obviousness or any motivation for their combination, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

2. Claims 3 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above, in view of WO-94/02202 (WO02). Applicant respectfully traverses. First, for the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything in WO02 that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims.

Moreover, the Office Action has cited no motivation in either Kawakami et al. and WO02 for combining these references in the manner of the Office Action. In fact, both Kawakami et al. and WO02 actually teach away from such a combination. For example, Kawakami et al. itself expressly recognizes that various battery characterization methods are inapplicable to other battery chemistries. (See Kawakami et al. at col. 2, line 27 – col. 3, line 46.) Moreover, WO02 itself expressly found lithium silver vanadium pentoxide to be impractical. (See WO02 at col. 3, lines 9-10.)

Because Kawakami et al. and WO02 fail to establish either a *prima facie* case of obviousness or any motivation for their combination, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

3. Claims 4 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above, in view of prior art disclosed by applicant, NPL document, "Lithium/Silver Vanadium Oxide Batteries for Implantable Defibrillators" (NPL). Applicant respectfully traverses.

For the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything in NPL that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

4. Claims 6 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above. Applicant respectfully traverses.

For the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

5. Claims 8 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above, in view of "Handbook of Batteries" by David Linden (Linden). Applicant respectfully traverses.

First, for the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell

terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims.

First, for the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything in Linden that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

Second, although the cited FIG. 2.1 of Linden apparently mentions the word “polarization,” it fails to mention “polarization angle” at all. The Office Action cites “ η ” shown in FIG. 2.1 as being a “polarization angle,” however, FIG. 2.1 of Linden graphs cell voltage vs. cell current, whereas the “polarization angle” recited in claims 8 and 17 of the present patent application is expressly defined in the specification of the present patent application:

FIG. 5 is a voltage vs. time graph, similar to FIG. 4, but illustrating a conceptual example for which the battery 106 is near the middle of its useful life. Comparing FIGS. 4 – 5, the battery terminal voltage drops, between times t_2 and t_4 , more quickly when the battery 106 is near the beginning of its useful life (see FIG. 4) than when the battery 106 is near the middle of its useful life (see FIG. 5). This rate of change, or “slope,” therefore, provides a useful indicator of the energy remaining in the battery 106. The slope can alternatively be expressed as a polarization angle θ , as illustrated in FIGS. 4 – 5. The polarization angle $\theta = \tan^{-1}(\Delta t / \Delta v)$, where Δt is a time difference and Δv is a corresponding voltage difference. FIGS. 4 – 5 illustrate θ_1 (for the beginning of the useful life of the battery 106) as being less than θ_2 (for the middle of the useful life of the battery 106).

(Application at page 8, lines 1-11.) Therefore, as expressly defined in the present patent application, the polarization angle is related to a time rate of change of voltage, instead of the cited “ η ” characterizing a graph of cell voltage vs. cell current, as shown in FIG. 2.1 of Linden. Accordingly, because Kawakami et al. and Linden apparently fail to disclose, teach, or suggest all elements (e.g., a “polarization angle”) of these claims, Applicant respectfully submits that no

prima facie case of obviousness exists with respect to these claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

6. Claims 10-12, 18 and 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above, in view of Traub (U.S. Patent No. 6,696,842). Applicant respectfully traverses.

First, for the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Because the Office Action fails to cite anything in Traub that would supply this missing element, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

Second, while Traub apparently does mention measuring a “quiescent voltage,” Applicant respectfully submits that this is no different than the open-circuit voltages of Kawakami, which are deficient in that they actually teach away from the present claims, as discussed above. Moreover, Applicant can find nothing in Traub or Kawakami et al. of using the measured quiescent voltage “to distinguish between the two different stored capacity values that correspond to the single change in terminal voltage across the cell.” In fact, neither Traub nor Kawakami et al. recognize the present problem, which is depicted in FIG. 7 of the present patent application: When polarization angle (as defined in the present patent specification) is used as a battery capacity indicator, a “bathtub” shaped curve results, as depicted in FIG. 7. Because the same polarization angle can actually correspond to two different states of discharge, the present patent application teaches how to use quiescent voltage to distinguish between the two. Because neither Traub nor Kawakami even use polarization angle, they do not recognize or solve the present problem and, therefore, fail to meet the claim element of using quiescent voltage “to distinguish between the two different stored capacity values that correspond to the single change in terminal voltage across the cell.” Accordingly, because all elements are not present in Traub or Kawakami et al., Applicant respectfully submits that no *prima facie* case of obviousness exists

with respect to these claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection of these claims.

Third, with respect to the Office Action's specific assertions regarding claim 12 as amounting to an "optimum or preferred value for a result effective variable," and therefore obvious, Applicant respectfully disagrees with this characterization. Claim 12 cannot be seen as a mere optimization of a variable because it actually involves switching between two completely different techniques for determining battery energy, i.e., from a measured voltage change during a substantially constant current pulse (during a first portion of the cell's life) to a measured quiescent voltage (during a later portion of the cell's life). The present patent application explains that, for certain battery chemistries, the quiescent voltage provides a more useful indicator of remaining energy during a latter portion of the cell's life than during the earlier portion of the cell's life, during which time the quiescent voltage is relatively flat. (*See* Application at page 10, lines 7 – 10.) Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection of claim 12.

7. Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami et al. (U.S. Patent No. 6,563,318), as disclosed above. Applicant respectfully traverses.

For the reasons discussed above with respect to the rejection under § 102, the cited portions of Kawakami et al. apparently fail to disclose, teach, or suggest measuring a cell terminal voltage change during a substantially constant current pulse, and in fact teach away from this by using *open-circuit* voltages for its determinations. Therefore, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to this claim. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of this claim.

8. Claims 20, 28 and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brink et al. (U.S. Patent No. 6,114,838). Applicant respectfully traverses.

Applicant cannot find in Brink et al. any disclosure, teaching, or suggestion of determining battery capacity using a difference between first and second battery voltages obtained during (the same) substantially constant first current pulse, as recited or incorporated in

these claims. Instead, Brink et al. apparently uses a difference between voltages obtained during different constant current pulses of different magnitudes. (*See* Brink et al. at col. 6, lines 4-19.) Accordingly, because all elements of the present claims are believed not present in the cited portions of Brink et al., Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Therefore, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

9. Claim 21 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Brink et al. (U.S. Patent No. 6,114,838), as disclosed above, in view of WO-94/02202 (WO02). Applicant respectfully traverses.

Applicant cannot find in Brink et al. any disclosure, teaching, or suggestion of determining battery capacity using a difference between first and second battery voltages obtained during (the same) substantially constant first current pulse, as recited or incorporated in these claims. Instead, Brink et al. apparently uses a difference between voltages obtained during different constant current pulses of different magnitudes. (*See* Brink et al. at col. 6, lines 4-19.) Accordingly, because all elements incorporated in claim 21 are believed not present in the cited portions of Brink et al., Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Therefore, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

Moreover, the Office Action has cited no motivation in either Brink et al. and WO02 for combining these references in the manner of the Office Action. In fact, both Brink et al. and WO02 actually teach away from such a combination. For example, Brink et al. itself expressly recognizes that various battery characterization methods are inapplicable to other battery chemistries. (*See* Brink et al. at col. 2, line 17 – col. 3, line 14.) Moreover, WO02 itself expressly found lithium manganese dioxide to be impractical. (*See* WO02 at col. 3, lines 9-10.)

Because Brink et al. and WO02 fail to establish either a *prima facie* case of obviousness or any motivation for their combination, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

10. Claim 22 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Brink et al. (U.S. Patent No. 6,114,838), as disclosed above, in view of WO-94/02202 (WO02). Applicant respectfully traverses.

First, for the reasons discussed above, the cited portions of Brink et al. apparently fail to disclose, teach, or suggest determining battery capacity using a difference between first and second battery voltages obtained during (the same) substantially constant first current pulse, as recited or incorporated in these claims. Instead, Brink et al. apparently uses a difference between voltages obtained during different constant current pulses of different magnitudes. (See Brink et al. at col. 6, lines 4-19.) Accordingly, because all elements incorporated in claim 22 are believed not present in the cited portions of Brink et al., Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to claim 22. Therefore, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of claim 22.

Moreover, the Office Action has cited no motivation in either Brink et al. and WO02 for combining these references in the manner of the Office Action. In fact, both Brink et al. and WO02 actually teach away from such a combination. For example, Brink et al. itself expressly recognizes that various battery characterization methods are inapplicable to other battery chemistries. (See Brink et al. at col. 2, line 17 – col. 3, line 14.) Moreover, WO02 itself expressly found lithium silver vanadium pentoxide to be impractical. (See WO02 at col. 3, lines 9-10.)

Because Brink et al. and WO02 fail to establish either a *prima facie* case of obviousness or any motivation for their combination, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

11. Claims 23-26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brink et al. (U.S. Patent No. 6,114,838), as disclosed above, in view of Traub (U.S. Patent No. 6,696,843). Applicant respectfully traverses.

First, for the reasons discussed above, the cited portions of Brink et al. or Traub apparently fail to disclose, teach, or suggest determining battery capacity using a difference between first and second battery voltages obtained during (the same) substantially constant first current pulse, as recited or incorporated in these claims. Instead, Brink et al. apparently uses a

difference between voltages obtained during different constant current pulses of different magnitudes. (See Brink et al. at col. 6, lines 4-19.) Accordingly, because all elements incorporated in claim 22 are believed not present in the cited portions of Brink et al. or Traub, Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to these claims. Therefore, Applicant respectfully requests reconsideration and withdrawal of this basis of rejection of these claims.

Second, regarding claim 24, Applicant cannot find in the cited portions of Brink et al. or Traub any disclosure, teaching, or suggestion of using a measured quiescent voltage to distinguish between two different stored cell capacity values that correspond to a single difference in terminal voltage across the cell. In fact, neither Traub nor Brink et al. recognize the present problem, which is depicted in FIG. 7 of the present patent application: When polarization angle (as defined in the present patent specification) is used as a battery capacity indicator, a “bathtub” shaped curve results, as depicted in FIG. 7. Because the same polarization angle can actually correspond to two different states of discharge, the present patent application teaches how to use quiescent voltage to distinguish between the two. Because neither Traub nor Brink et al. even use polarization angle, they do not recognize or solve the present problem and, therefore, fail to meet the claim element of using quiescent voltage “to distinguish between the two different stored capacity values that correspond to the single change in terminal voltage across the cell.” Accordingly, because all elements are not present in Traub or Brink et al., Applicant respectfully submits that no *prima facie* case of obviousness exists with respect to claim 24. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection of claim 24.

Third, with respect to the Office Action’s specific assertions regarding claim 26 as amounting to an “optimum or preferred value for a result effective variable,” and therefore obvious, Applicant respectfully disagrees with this characterization. Claim 26 cannot be seen as a mere optimization of a variable because it actually involves switching between two completely different techniques for determining battery energy, i.e., from a measured voltage change during a substantially constant current pulse (during a first portion of the cell’s life) to a measured quiescent voltage (during a later portion of the cell’s life). The present patent application explains that, for certain battery chemistries, the quiescent voltage provides a more useful

indicator of remaining energy during a latter portion of the cell's life than during the earlier portion of the cell's life, during which time the quiescent voltage is relatively flat. (See Application at page 10, lines 7 – 10.) Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection of claim 26.

Allowable Subject Matter

Claim 9 was objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Nonetheless, Applicant believes that the base claim and any intervening claims are patentable in their present form. Accordingly, Applicant respectfully requests reconsideration and early allowance of all pending claims.

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CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 373-6951 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.


Respectfully submitted,

KRISTOFER J. JAMES ET AL.

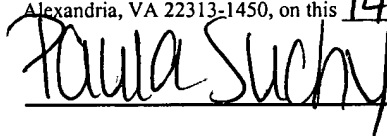
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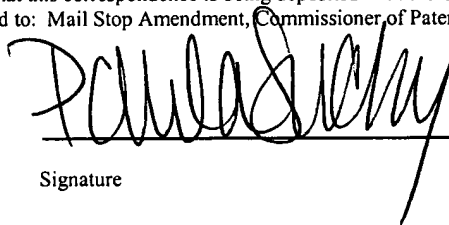
Date October 14, 2005

By 
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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 14 day of October, 2005.



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